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Promoting innovative nEtworks and cLusters for mArine renewable energy synerGies in mediterranean cOasts and iSlands

Existing Policy and regulatory status on MED Blue Energy development

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1 Purpose of this document

This document summarizes the available information on the national implementations of the EU 2009/28/CE Directive in Mediterranean member states, focusing on current legislation, applicable regulations and authorization processes relevant for the development, installation and operational set up of offshore infrastructures for renewable energy production. It capitalizes on the work done in past national and international projects, and will account for the adoption of Maritime Spatial Planning (MSP) initiatives in compliance with the 2014/89/EU Directive. The information and experience gained within the constantly incentivized Blue Energy Clusters will be provided, in support of the growth and internationalization of European SMEs in the sector of marine renewables.

2 Policies promoting Blue Energy production in the Mediterranean Sea and regulatory status on MED Blue Energy installations

2.1 EU policies

The reference European regulation for the promotion of the use of energy from renewable sources is the EU 2009/28/CE Directive, which sets a common framework for Member States. It sets targets for all EU countries with the overall aim of making renewable energy sources account for 20 % of EU energy and 10 % of energy specifically in the transport sector by 2020, obliges Member States to design national action plans for 2020, setting a share for renewable energy sources in transport, heating and the production of electricity; it sets a renewable-energy exchange scheme to help EU countries to achieve targets cost-effectively, and obliges Member States to guarantee the origin of electricity, heating and cooling produced from renewable energy sources, and to build the necessary infrastructure for using renewable energy sources in the transport sector. For the specific Blue Energy sector, Directive 2014/89/EU is also relevant, which establishes a framework for the implementation of maritime spatial planning and integrated coastal management by Member States aimed at promoting the sustainable growth of maritime economies, the sustainable development of marine areas and the sustainable use of marine resources.

2.2 National policies (including support to technological innovation, MSP and CZM)

2.2.1 Italy

Italy prioritized and incentivized the deployment of renewable energies by adopting a set of rules and regulations, which transposed the EU 2009/28/CE Directive into the Italian national legislation. The principles and the objectives of such regulatory framework are summarized in the National Action Plan for Renewable Energies of 2010 (http://www.gse.it/it/Statistiche/Simeri/AreaDocumentale/Documenti Piano di Azione Nazionale/PAN DETTAGLIO.pdf), followed in 2013 by the National Energy Strategy (http://www.sviluppoeconomico.gov.it/images/stories/normativa/20130314_Strategia_Energetica_Nazionale.pdf). The former also reports the relevant Italian legislation already in force at the time, and classifies legislative acts as to their compliance to specific indications of the transposed Directive, according to the following categories:

- Measures in compliance to Articles 13, 14, 16 and 17 to 21 of the cited Directive (Administrative procedures, regulations and codes)
- Measures favouring the production of electrical power from renewable sources
- Measures favouring the utilization of renewable energies in heating/cooling systems
- Measures favouring the utilization of renewable energies in the transport sector
- Specific measures aimed at promoting energy uses of biomass
- Statistical transfers between Member States and joint projects between member states and Member States and third countries

The latest indications and regulatory measures for the operative implementation of the National Strategy and Plan have been issued in D.M. 23/06/2016. Relevant national legislation that transposes the EU 2009/28/CE Directive (up to 2013) is available at http://eur-lex.europa.eu/.

Measures currently in force that are relevant to the Blue Energy sector are summarized below.

- **Administrative procedures, regulations and codes**

General framework

The general framework of the Italian legislation governing the energy sector is delineated in D.Lgs. 112/1998, which transferred to Regions the related administrative functions, with the exception of those explicitly attributed to the National Government or delegated to local authorities, while the legislative power on the subject was kept under the exclusive competence of the National Government. With specific reference to renewable energy sources, Constitutional Law 3/2001 modified the repartition of competences between the National Government and Regions, and attributed the subjects of the national production, transport and distribution of energy to the concurrent legislative powers of the National Government and of the Regions. It is, therefore, the prerogative of the National Government to establish the fundamental principles of each subject through the national legislative acts, and that of the Regions to exert their legislative power in the constraining framework of such principles, as explicitly determined by the National Government. Additional constraints are represented by EU Directives, and by the National Government having sole competence on transversal subjects, such as the protection of the environment and of competition. Regions are responsible for the regulative and administrative functions that are not explicitly attributed to local authorities or to the National Government. For offshore energy production from renewable sources, D.Lgs. 387/2003 constitutes the main reference, in particular Art. 12 and its subsequent amendments. In accordance with the current repartition of functions, each Region proceeded to legislate and regulate energy through specific acts, which are listed, together with the relevant national legislation, in Appendix 4.2.1.A to the National Action Plan.

Authorization procedure

The simplified authorization procedure for energy production from renewable sources currently in force was introduced via D.Lgs. 387/2003, which transposed EC Directive 2001/77/EC. In particular, Art. 12 of D.Lgs. 387/2003 and its subsequent amendments prescribe that the construction and operation of such plants, as well as their modification, upgrade, total or partial restoration, reactivation, and necessary works

and/or infrastructures and interconnection facilities, are subject to a single authorization (*autorizzazione unica*), which is issued by a single responsible authority. Nevertheless, such authorization must comply with the legislation in force as to the protection of the environment, of the landscape, and of cultural heritage, and it must undergo a complex administrative procedure designed to ensure the involvement and coordination of all the authorities and administrative bodies that represent and protect the different and diverse public interests involved. Therefore, the authority responsible for the authorization is to convene the *Conferenza dei Servizi* (Conference of Services), an assembly introduced via L. 241/1990, where the potentially concerned institutions, administrations and representative bodies are summoned in order to jointly examine and evaluate the proposed project. A motivated final resolution is then taken, according to the prevailing position, within 180 days from the application. The juridical expression *prevailing position* can be a matter of interpretation, as the single position of each participant in the Conference needs to be weighed by the authority each possesses to condition or bind the authorization procedure, according to the legislation in force. Once issued, the single authorization replaces the several permits and licences required under the old regulatory regime.

In the case of offshore installations, the single authorization is issued by the Ministry of Transport and Infrastructures (*Ministero delle Infrastrutture e dei Trasporti*), upon approval by the Ministy of Economic Development (*Ministero dello Sviluppo Economico*) and by the Ministry of *Enviroment* (*Ministero dell'Ambiente e della Tutela del Territorio e del Mare*), having been granted rights to the use of state owned maritime properties and sea waters (according to the provisions of Art. 36 of the *Codice della Navigazione* – Marine Traffic Regulations), and having been examined and passed by the *Conferenza dei Servizi*. As the deployment of public maritime property and sea waters with the scope of energy provision also falls under the Italian national administrative jurisdiction and is not the object of concurrent legislation (according to the provisions of Art. 28, 29, 30, 31 and 105 of D.Lgs. 112/1998, and of Art. 1 of L. 239/2004), single Regions cannot oppose the installation of plants off their coast once the authorization is issued, as confirmed by the *Consiglio di Stato* (i.e. Council of State, a constitutional body that ensures the legality of public administration, having both jurisdictional and consultative functions), with sentence n. 3252, July 1st 2015. The authorization therefore permits sponsors to proceed with the works and operate the plants according to the project approved, in compliance with the prescribed requirements and reporting obligations that guarantee the safety and consistence of the national power system and the protection of the environment. The single authorization also determines the decommissioning and site restoration requirements, and the deadlines for the initiation and completion of the works, whose expiration will cause the same authorization to lapse.

However, despite the described simplification effort, the process the application undergoes, from its submission to its final approval or rejection, can turn out to be less straightforward than expected, and its time frame difficult to anticipate. Despite the

identification of a unique responsible authority, the applicant is required to submit her/his application to all three competent Ministries, while a parallel application to be granted rights to the use of state owned maritime properties and sea waters is to be submitted to the *Ministero delle Infrastrutture e dei Trasporti.* In all cases, applications must be accompanied by the preliminary project, which must include a budget analysis for the necessary electrical connections, issued by the national electric network operator, according to Resolution ARG/elt 99/08, Art. 6 and 21, of the Authority for Electricity and Gas. With reference to the necessary linear infrastructures, the preliminary project must also explicitly indicate the potentially concerned areas subject to pre-established confiscation constraints, buffer zones, and the necessary protection measures.

As a matter of fact, the application submission to the *Ministero dell'Ambiente e della Tutela del Territorio e del Mare* is delayed by the eventual completion of a positive preliminary evaluation process for the granting of rights over maritime properties, as it must be accompanied by the final project**,** accounting for the revisions and indications emerged during the evaluation process for the granting of such rights, by the related environmental impact study (Studio di Impatto Ambientale – S.I.A.), and by a list of the granted authorizations, together with a non-technical, easily reproducible, description of the proposed project and of its expected impact on the environment, that can be easily comprehended by the general public. The applicant is allowed 60 days for the preparation and submission of such documentation. The *Ministero dell'Ambiente, del Territorio e della Tutela del Mare* then issues the *Valutazione di Impatto Ambientale* (V.I.A. - Environmental Impact Assessment). The time required for issueing the V.I.A. goes from a minimum of 150 days to a maximum of 330, should additional studies be required. These interval is to be added to the time already elapsed in assessing the feasibility of the electric connections and to the technical time necessary for obtaining the granting of rights to the use of state owned maritime properties and sea waters (approximately limited to 75-90 days altogether).

On receiving approval by the Ministero dell'Ambiente through a positive V.I.A., within 30 days the Ministero delle Infrastrutture e dei Trasporti summons the Conference of Services in order to evaluate the application, and, in the case of a favourable prevailing position, issues the authorization within 90 days (reduced from the former 180 days via D.Lgs. 28/2011). Although the starting date for the computation of such term is virtually that of the application submission, time limits are suspended until the V.I.A. is issued and the formal act granting rights over maritime properties obtained. The total duration of the process can be well over a year.

Due to the nature and the complexity of the matter, a variety of public bodies, administrations and stakeholders are liable to be concerned and therefore to participate in the authorization process, ranging from Regions to municipalities, to the *Uffico del genio Civile per le Opere Marittime* (Marine Civil Engineering Department), to the *Circoscrizione doganale* (District Customs Bureau), to any other concerned administrative

body or authority, that in force of legislation and/or regulation is entitled to represent specific public interests. The reason for such broad engagement is that the interests and values at stake are multifaceted, possibly intertwined although often competing, so that the decision process must be fully participatory, achieving the best balance between all the goals and constraints. Among these, the protection of fisheries, the preservation of landscape values, the safeguard of public security and health, the respect of hydrogeological constraints, the conservation of submerged archaeological sites and protected areas.

Regulation of information, policy guidance and training (art. 14, par. 1, 2 and 4)

D. Lgs. 28/2011 ordered the creation of a web portal to serve as a national reference for information as to renewable energy and energy efficiency. Information as to authorization procedures is also released through the portal. The Gestore dei Servizi (GSE - Authority for Energy Services), is responsible for the management of the portal (http://www.gse.it/it/EnergiaFacile/Pages/default.aspx), and for the publication of the annual report on national, regional and local authorization procedures, whose effectiveness is to be constantly monitored (according to the provisions of D.M. 10/9/2010), in order to identify best practices and improve current regulations.

Technical measures

In compliance with the EU 2009/28/CE Directive, a number of technical measures and regulations were also defined and are constantly monitored and upgraded, including technical specifications for the plants, the related infrastructures, storage facilities, the electrical connections and the distribution grid functioning. Measures for the development of infrastructures for district heating and cooling are also envisioned.

- **Promoting the production of electrical power from renewable sources**

  A variety of financial measures were introduced, monitored and updated in order to promote and sustain the production and utilization of renewable energy. Among these, green certificates, feed-in tariffs, and measures introduced via D.M. 6 July 2012 (ref. *Terza relazione dell'Italia in merito ai progressi ai sensi della direttiva 2009/28/CE,* 2015, http://www.gse.it/it/Statistiche/Simeri/AreaDocumentale/Documenti Piano di Azione Nazionale/Progress Report 2015 Italia.pdf)

2.2.2 Spain

In Spain, the regulatory framework for marine energy is determined by several laws, such as RD 661/2007, which regulates the production of electricity in a special regime and identifies wave and tidal energy in group b.3 and RD 1028/2007, which establishes the administrative procedure for authorization of electricity generation facilities in the territorial sea.

The legal regulation of renewable energies has its own connotations that converge with the difficulties arising from the higher regulatory levels, giving it a great legal complexity and hindering the integral management of them [1]. Currently, there is no basic legislation on renewable energies, which effectively transposes Directive 2009/28/EC [2].

To the above, in relation to the remuneration aspects of renewable energies, with the new Law 24/2013, of December 26, of the Electricity Sector [3] and the Royal Decree 413/2014 of 6 June, regulating the activity of producing electric energy from renewable energy sources, cogeneration and waste [4], the environmental component has been relegated to a secondary level, taking full advantage of the principle of economic and financial sustainability of the electric system. The economic crisis, fiscal consolidation policies and the growth of the dynamics related to a greater discharging to the discontinuous electricity grid (plants that cannot produce to the maximum of their power capacities) have had more strength than the environmental component of Renewable energy [5].

Thus, the picture of renewable energy in general and of offshore wind in particular is not very encouraging as far as the regulation of its economic regime is concerned, especially if, as it seems, the Spanish Legislator is not able to understand whereas, under the Directive 2009/28/EC, the range of support systems for renewable energies extends beyond traditional bonuses, and that the fight against the tariff deficit is compatible with any of them, especially if one takes into account that it was probably not the those bonuses that generated it [1].

Notwithstanding the foregoing, since this premium system is based on development policies of alternative energy sources, singled out in premiums on the production and connection of producers to the electricity grid. Since this system is compatible with Directive 2009/28/EC, it is true that some authors [6] have questioned the permanence of this support system, especially due to the current economic situation and, in particular, to the assumption by the final consumer of this technology financing. It cannot therefore be overlooked, as stated above, that Directive 2009/28 / EC opens the door to a wide range of support systems of a different legal nature, in which not only bonuses but also investment aid, levies, tax refunds, the obligation to use renewable energy, etc.; showing that what is essential is the promotion of renewable energy sources and not the option chosen in order to promote them [7]. In other words, the Spanish legislator can modify the system of bonuses, but what is not admissible that, obviating the incentive alternatives available to it, infringes the community mandate to promote renewable energy sources [1].

Finally, it is not better the foreseen scenario when descending to the regulation of the procedure for the authorization of offshore wind farms, designed by Royal Decree 1028/2007, of July 20, establishing the administrative procedure for the processing of requests for authorization of electricity generation facilities in the territorial sea [8], which has two major shortcomings: the first one, which does not achieve its objective of integrating in a single procedure all the relevant procedures for the authorization and start-up of the installations from offshore wind turbines [9]; and the second, which greatly limits the participation of the Autonomous Communities in such procedure, hence generating major malfunctions in the integral management of sectors, matters and interests concurrent in any procedure for authorization of Offshore wind farm facilities [1].

2.2.3 France

There are no specific laws related to marine renewable energies in France. MRE are included in overall plans and strategies related to energy in general.

Following the 2009 “Grenelle de la Mer”, the Ministry of Environment presented a plan for the development of renewable energies for France, with targets for 2020 for offshore wind of 6000 MW installed.

Therefore, in June 2009, the State initiated a consultation and planning body for offshore wind at sea fronts under the presidency of the Maritime Region Prefects. This body brought together the services of the State, local authorities, associations, professionals and experts, among them Ifremer. The general objective of this body was to identify so-called "suitable" zones for offshore wind, by mapping existing constraints. Maps have been developed in the Mediterranean. It is in the continuity of this planning that 3 offshore floating pilot wind fields were selected in the Mediterranean at the end of 2016.

In 2015, two major acts “The Energy Transition for Green Growth Act” and “The National Low Carbon Strategy” have been ratified.

These plans which have been designed in 2015 by the Ministry of Environment, Ecology and Sea, defines quantitative objectives in terms of decrease of the country's energy consumption and of increase of the share of renewable energies in the total production. MRE have their own objectives of development at short, medium and long terms. Specific calls for proposal to finance MRE devices (demonstrator to commercial deployment) are also planned in this overall strategy.

The Energy Transition for Green Growth Act

The Energy Transition for Green Growth Act, adopted in 2015, aims to reduce France's energy bill (70 billion euros), to generate employment in new activities (100,000 over three years) and to fight against greenhouse gas emissions.

Among the objectives set: to divide by two the country's total energy consumption by 2050, to reduce the share of nuclear energy of 50% by 2025 and to reduce of 30% the share of energy generated by nuclear energy in 2030 from fossil fuels or Increase the share of renewable energies of 32% by 2030. The Ministry of Ecology mobilizes 10 billion euros over three years to initiate the transition process.

To facilitate this transition, specific objectives have been identified:

- Improve energy efficiency and reduce the consumption of fossil fuels;
- Accelerate the development of renewable energies;
- Maintain a high level of security of supply in compliance with environmental requirements;
- Preparing the energy system of tomorrow;
- Developing clean mobility solutions;
- To take into account the economic and social stakes of the energy transition and to act with the territories.

A multiannual energy program (PPE) was drawn up from March 2015 by involving a large number of stakeholders:

- A monitoring committee, composed mainly of the members of the National Council for the Ecological Transition and the Higher Council of Energy, was set up to discuss the modalities of PPE development and its main orientations;
- A participatory approach with 22 workshops organized between the end of March and the beginning of June 2015, on all the themes addressed by PPE. More than 800 people attended these workshops, over a hundred presentations were made and 70 written contributions were shared;
- A specific workshop was organized in December 2015 on the issue of the clean mobility development strategy.

The table below (source: Ministry of Environment, Ecology and Sea) specifies the objectives to be reached according strategy. Renewable marine energies (offshore Floating farm, wave & tidal, OTEC) are expected to reach a capacity of 100 MW by 2023. The Offshore wind with fixed foundations targets by 2023 a production of 3000 MW.

A Roadmap 2016-2019 to launch the tenders and call for projects related electric renewable energy has been issued. Some of these calls have already been launched with for instance the call related to the implementation of pilot floating wind farms.

The permits to establish ocean energy devices are issued by the representation of the State in region, the Prefectures.

	2014	2018	2023 bas	2023 haut
Eolien terrestre	9 300 MW	15 000 MW	21 800 MW	26 000 MW
Solaire photovoltaïque	5 300 MW	10 200 MW	18 200 MW	20 200 MW
Hydroélectricité	25 300 MW (~~82 TWh~~)	25 300 MW (~~81 TWh~~)	25 800 MW (~~83 TWh~~)	26 050 MW (~~84 TWh~~)
Eolien en mer posé		500 MW	3 000 MW (entre 500 et 6000 MW de plus de projets engagés, en fonction des concertations sur les zones propices, du retour d'expérience de la mise en oeuvre des premiers projets et sous condition de prix)	
Energies marines (éolien flottant, hydroliennes, etc.)			100 MW (entre 200 et 2 000 MW de plus de projets engagés, en fonction du retour d'expérience des fermes pilotes et sous condition de prix)	
Bois énergie	~~257~~	~~510 MW~~	~~700 MW~~	~~1 040 MW~~
Méthanisation	85 MW	137 MW	237 MW	300 MW
Géothermie électrique		8 MW	53 MW	
Déchets, biogaz de décharge et de STEP	~1200 MW	~1350 MW	~1500 MW	
TOTAL	41 GW	52 GW	71 GW	78 GW

The National Low Carbon Strategy

The national low-carbon strategy was introduced on August 17, 2015, on the energy transition for green growth. It defines the different actions to be carried out to reduce the greenhouse gas emissions. It sets an implementation process of the transition to a low-carbon and sustainable economy. It facilitates the steering of policies to reduce greenhouse gas emissions by public decision-makers. The national low-carbon strategy aims at a four-fold reduction of greenhouse gas emissions by 2050, but also allows to respect the carbon budgets fixed for the periods 2015-2018, 2019-2023

and 2024- 2028, as well as France's commitment to the European Union, to reduce its greenhouse gas emissions by 40% by 2030.

The Network of Energy Distribution – RTE (Réseau de Transport d'Energie France)

Electricity network infrastructures are essential and represent heavy investments. Two new characteristics have to be taken into account by these networks: the development of smart grids and the reception of the production of sustainable energy and particularly MRE.

The figure below details the French Electricity network, from the production, the losses to the consumers.

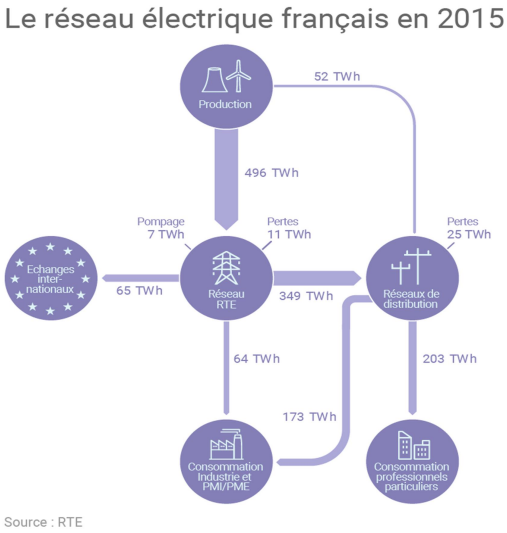

Fig. 1 - French electricity network

Renewable energies are by nature intermittent and difficult to predict. For this reason, national networks in Europe are evolving moving from centralized energy supply centers (nuclear power plants, thermal power stations, etc.) to distribution sites that are distributed or even very decentralized. Beyond national networks, the interconnection of networks between EU countries is essential because there are many existing exchanges between these countries. According to the French network, 65 TWh were traded with European countries in 2015, i.e. about 15% of French production.

These exchanges are expected to be multiplied by the introduction of renewable energies, due to the uneven distribution of the resource.

The figure below concern the plans for the development the French network (up to 2030) which is currently discussed taking into account the reception of these new sources of energy. This map is only provided as an illustration because the collaborative work it is not yet finalized and will certainly evolve according to the achievements especially of the MRE in the Mediterranean.

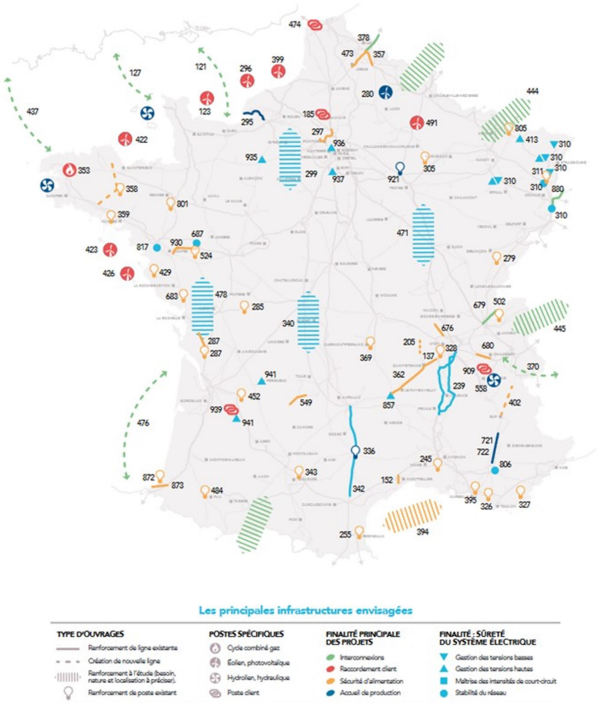

Fig. 2 - Infrastructures envisaged for 2030

Environmental impact assessment of MRE structures (submerged, semi-submerged or floating)

The French Environmental Code, in its article R.122-2, requires the identification of a limited number of issues to be dealt with in detail in the impact assessment. It makes it possible to define the specifications and the content of the impact assessment that will be carried out subsequently.

The themes to be analysed in the case of MRE projects concern both the marine environment and the terrestrial environment. Five study areas are identified whose outlines are determined on a case-by-case basis.

As presented in the figure below, the five areas are:

- Remote area: Limit of the potential impacts;
- Coastal area: Analysis of socio-economic impacts;
- Intermediary area: Area of influence of the MRE project;

- Proximity area: Potential area of establishment of the MRE system;
- Project area.

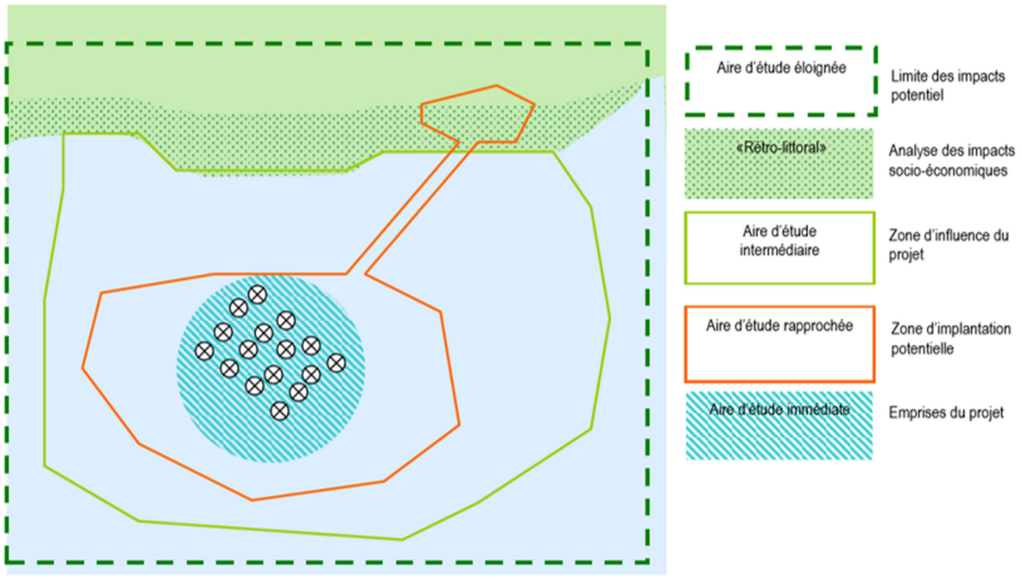

Fig. 3 - Studied areas for the environmental impact assessment of a MRE project

The Environmental Code specifies the steps to be followed in any MRE project:

- Analysis of the initial state;
- Assessment of effects on the environment;
- Project selection;
- Definition of measures: The selected project must be accompanied by the "measures envisaged by the contracting authority to eliminate, reduce and, if possible, compensate for the damaging consequences of the project on the environment and health, as well as the estimate of corresponding expenditure";
- Follow-up of the site;
- Decommissioning and restoration of the site.

Pricing Policy

It is essential to make a rapid statement of electricity prices because the introduction of Renewable Energies (RE) and MRE specifically depends very much on the price policy.

RE are more expensive than conventional energies although these costs decrease with experience. This is normal because these "classical" energies (fossil, nuclear) have been developed for decades and have been heavily funded by the state mainly for strategic reasons.

States have therefore required electric producers to "buy back" the electricity produced by the REs at prices comparable to the electricity produced by fossils or nuclear power. But, the states finance these additional costs by supporting electricians. The support is financed by taxes on the prices of electricity paid by consumers. However, it is consumer prices "households" that essentially support these taxes so it does not penalize industrial consumers who compete globally (USA, China, Brazil, etc.)

In France the "Contribution to the Public Electricity Service (CSPE)" is around € 25 /MWh. In Germany, this cost is around € 80/MWh.

The price paid by consumers is the sum of several costs:

- the cost of production by power plants (fossil, nuclear, wind, hydro, etc.). This is the cost that is generally used to compare different production types. This cost is, in order of size 1 / 3 of the total cost. This cost includes amortization of investments and operations (CAPEX + OPEX);
- the cost of routing, that is to say essentially networks (CAPEX + OPEX);
- taxes including the cost of compensation for the costs of the RE: "Contribution to the Public Electricity Service (CSPE) in France and VAT.

In France the relative amount of each item is roughly equal to 1/3 of the total. In Germany, the distribution is 28%, 32%, 40%, respectively.

Obviously these prices evolve and are different according to the countries because the natural and political contexts are different. The map below shows the average prices paid by consumers in 2013 (Eurostat)

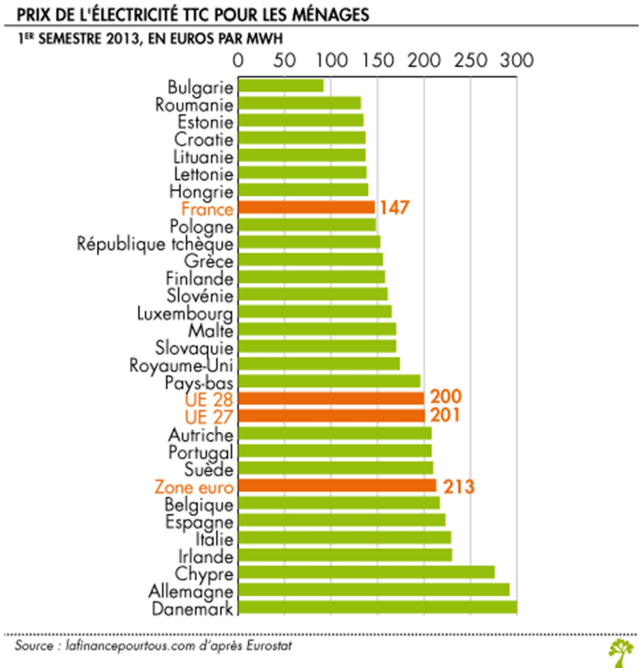

Fig. 4 Electricity prices in EU countries (source: Eurostat)

2.2.4 Croatia

In Croatia there are no specific policies and authorization procedures for building offshore infrastructures for the exploitation of Blue energy. Actual laws regulate use of renewable energy sources (RES) with only few references to Blue energy. Several legislation documents exist which are responsible for RES and RES integration into the energy system. The most important national

legislation documents related to RES projects, and in that way also to Blue energy projects, are following:

- Energy Act (Official Gazette 120/12, 14/14, 95/15, 102/15)

  The Act regulates measures for the safe and reliable supply of energy and its efficient production and use, acts establishing and pursuant to which energy policy and energy development planning are implemented, execution of energy activities, on the market or as public services, and fundamental issues in the execution of energy activities.

  Under Article 3, Point 17 the renewable energy sources are named, and these include renewable non-fossil energy sources (aerothermal, biomass, **sea energy, wind energy,** hydropower, geothermal and hydrothermal energy, gas from landfills, gas plant for waste water treatment and biogas, solar energy).

  Under Article 4, Point 1 states that the locations for construction of energy facilities that are explored and registered in the state spatial plans are of interest for the Republic of Croatia. Under the same Article, Point 2 it states that the construction of energy facilities, maintenance and use of these energy activities are of interest to the Republic of Croatia.

- Regulation of Energy Activities Act (Official Gazette 120/12)

  The Act regulates the establishment and implementation of the regulation system for energy activities, the process of establishment of the body for energy regulation, and other issues of importance for energy regulation.

- Electricity Market Act (Official Gazette 22/13, 95/15, 102/15)

  The Act regulates the manner of performing energy activities in the areas of electricity and the production of electricity, the transmission of electricity, distribution of electricity, supply of electricity and organization of the electricity market.

  The Act governs the Energy approval for a new production facility. The production facilities can be built by legal or private entity, if the intend production facility meets the criteria laid down in the procedure for issuing energy approval. The criteria for the procedure for issuing energy approval for the construction of production facilities are public, and are based on the principles of objectivity, transparency and impartiality.

- Rules of the Electricity Market Act (Official Gazette 135/06, 146/10, 90/12)

  The Act regulates the rules of the Croatian Electricity Market.

- The renewable energy sources and high-efficiency cogeneration Act (Official Gazette 100/15)

  The Act regulates the planning and encourages the production and consumption of electricity produced using renewable energy sources and high-efficiency cogeneration. The Act establishes measures to encourage the production of electricity using renewable energy sources and high-efficiency cogeneration, governs the implementation system to encourage the production of electricity from renewable sources energy and high-efficiency cogeneration, regulates the issues of

construction of plants for the production of electricity from renewable energy sources and high-efficiency cogeneration on state land. The Act further regulates the keeping of the register of renewable energy sources and high-efficiency cogeneration projects, project developers and privileged producers of electricity from renewable energy sources and high-efficiency cogeneration, regulates the issue of international cooperation in the field of renewable energy and other issues of importance for the use of renewable energy sources and high-efficiency cogeneration.

The Act governs the planning, design, construction, use, maintenance and removal of production facilities and production units that produce electricity from renewable energy sources and high-efficiency cogeneration. The Act stipulates that in an appropriate manner the provisions of the regulations governing the protection of the environment and nature protection and preservation of cultural goods, state aid, spatial planning, construction, electricity market, concession, maritime domain, water management, the pursuit of economic activities, the right ownership and other related rights and the provisions of other regulations.

Under Article 4, Point 11 the renewable energy sources are named, and these include: aerothermal, biomass, energy from bio-liquids, **sea energy**, hydropower, **wind energy**, geothermal and hydrothermal energy, gas from landfills, gas from wastewater treatment and biogas, solar energy and biodegradable fraction of certified waste for energy production in an economically viable manner in accordance with the regulations of the administrative area of environmental protection.

- Ordinance on the status of privileged electricity producer (Official Gazette 88/12)

  The Ordinance establishes conditions for acquiring the status of privileged electricity producers which may be acquired by a project holder or producer simultaneously produces electricity and heat, uses waste or renewable energy sources for electricity production in an economically viable manner in compliance with environmental protection.

- The tariff system for electricity produced from renewable energy sources and Cogeneration (Official Gazette 63/12, 121/12, 144/12)

  The Tariff System for the production of electricity from renewable energy sources and cogeneration regulates the right of privileged producers of electricity to an incentive price of electricity paid by the market operator for the electricity produced and delivered from plants using renewable energy sources and cogeneration plants, excluding its own consumption.

  Power plants using blue energy for power generation are included in the tariff system under the designation **other power stations on renewable energy**.

- Thermal Energy Market Act (Official Gazette 80/13, 14/14, 102/14, 95/15)

  The Act regulates measures for safe and reliable supply of thermal energy to the thermal systems to be used for heating and cooling. It regulates the conditions for obtaining concessions for the distribution of thermal energy, or the concession for the construction of the distribution network, policies and measures for the safe and reliable thermal energy production, distribution and supply to

the heating and cooling system, and measures to achieve energy efficiency in heating and cooling systems.

Under Article 4, Point 3 it is stated that the use of renewable energy as a source of thermal energy in the interest of the Republic of Croatia.

Related to the production of thermal energy, Article 15, Point 2 states that the the energy entity using cogeneration unit and using waste, biodegradable waste or **renewable energy sources for the production of thermal energy** in an economically viable manner, in accordance with the regulations governing environmental protection and waste management, may gain the **status of privileged producer** of electrical and thermal energy.

- Physical Planning Act (Official Gazette 153/13)

  He Act regulates the physical planning system: aims, principles and subjects of physical planning, spatial monitoring and monitoring in the field of physical planning, spatial planning requirements, adoption of the Spatial Development Strategy of the Republic of Croatia, spatial plans including their development and adoption procedure, implementation of spatial plans, building land development, property postulates of building land, development and supervision.

  As can be noted from the Croatian legislation, in order for a natural or legal person to be granted with a concession on maritime demesne, e.g. the right for exploitation of maritime demesne, and to carry out the activities with the respect to blue energy, rules set up by spatial plans need to followed and respected. However, the current spatial plans (county or national) do not predict any blue energy installations on the Croatian maritime demesne, and therefore cannot be implemented.

  In the following, Figure 5 depicts the plan for future energy related infrastructure locations, preserved natural locations and international waterways inside Croatian territorial waters. As can be noted there are no predicted maritime demesne areas for blue energy installations.

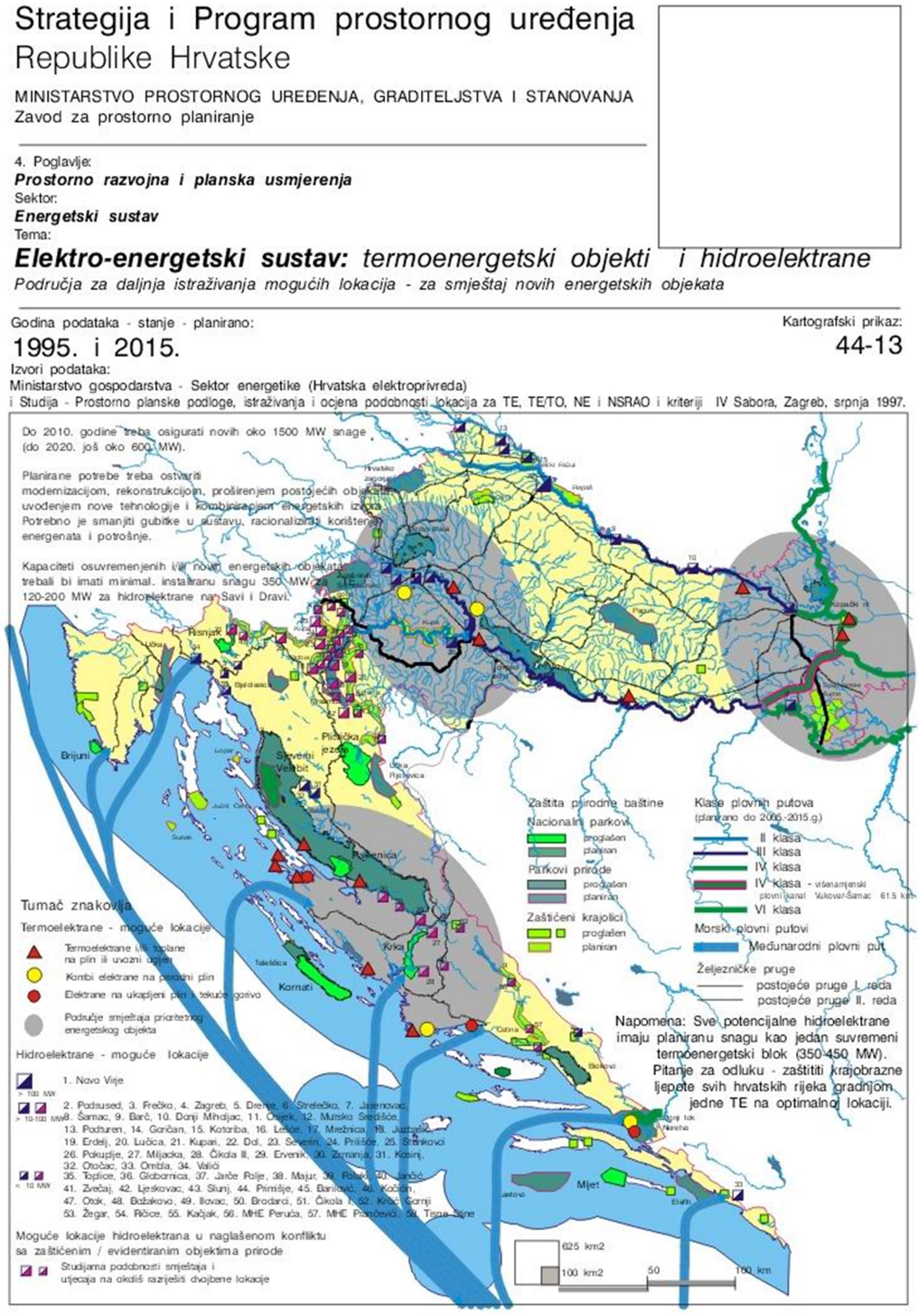

Fig.5: Spatial planning Strategy of the Republic of Croatia, Croatian energy system – Plan for future energy related infrastructure locations [10].

2.2.5 Greece

Energy framework

Renewable energy policy in Greece is bounded by EU requirements and targets. The imperative energy savings target of 2020 has replaced the less strict targets for 2010 as regards electricity from renewable energy sources (RES) and biofuels. In this context, under Directive 2009/28/EC9, Greece should increase the above share to 18% in 2020 from approximately 7% in 2005. Furthermore, on October 2014, the European Council adopted a binding target of reducing CO_2 emissions by at least 40% by 2030 compared to 1990. In this context, the energy objectives for Greece include, among others, 100% electrical interconnection of all Greek islands. In order to achieve the above targets, Greece has adopted various measures on renewable energy and energy efficiency. For example, the National Renewable Energy Action Plan and its updates is described in detail in the following document: http://www.ypeka.gr/LinkClick.aspx?fileticket=CEYdUkQ719k%3D&tabid=37.

In Greece, electricity from RES was promoted until recently through feed-in tariff (FiT) (regulated according to L. 3851/2010), subsidies tax exemption and a net metering scheme. Based on FiT, the RES support scheme caused a series of distortions and malfunctions in the Electricity Market, resulting among others to overcompensation of several categories of RES producers and to the imposition of a RES Special Charge. Moreover, the future market conditions for "new entries" were not very clear, disabling possible investors to act and financing institutions to take risks. Therefore, it was considered that the transition to an economically viable support scheme for RES – including provisions for High Efficiency Cogeneration of Heat and Power (HECHP) power plants – based on a combination of a Feed-in Premium (FiP) and tenders, would consist an efficient solution for gradually bridging the gap to meet real market conditions and for balancing responsibilities regarding compensation of RES producers. The aforementioned scope is served through a new law, L. 4414/2016.

Current legislation framework in Greece – L. 3851/2010 and L. 4414/2016

The renewable electricity generation technologies that are currently in use in Greece are under the responsibility of the Hellenic Electricity Distribution Network Operator (HEDNO S.A.), as regards the operation, maintenance and development of the Greek power distribution network. The Greek operator for the electricity market (HEMO S.A.), on the other hand, is responsible for the operation of the electricity market in accordance with the provisions of L. 4001/2011 and conducts the daily energy planning. A detailed description of the RES status in Greece can be found in http://www.res-legal.eu.

The permitting process for OWFs was regulated by L. 3851/2010. It simplified the licensing procedures, revised the FiT system and tackled barriers to renewable energy projects at local level. It also established specific regulations for the use of renewable energy in buildings in accordance with the Energy Performance of Buildings Regulation

(https://www.iea.org/publications/freepublications/publication/Greece2011_unsecured.pdf). Some additional accommodations and updates for the fostering of RES were made with the validation of L. 4062/2012, sec C, in order to be also compatible with EU Renewable Energy Directive 2009/28/EC.

The new law L. 4414/2016 actually reforms RES support scheme in respect to the European Commission's Environmental and Energy Aid Guidelines. It promotes RES integration into the electricity market at an optimum cost-effectiveness level while giving a relevant priority to the exploitation of domestic renewables, in order for Greece to meet its 2020 target. Furthermore, it will be feasible to amend the current framework concerning RES Special Charge and the structure of the RES Special account. The responsibility for the organisation and the performance of the relevant competitive bidding processes is assigned to the Regulatory Authority for Energy (RAE), whereas two Ministerial Decisions are pending for the exact determination of the bidding processes. The overall context is completed by the L. 4425/2016 on reforming the wholesale electricity market in line with the EU Target Model.

The concept of the new RES support scheme

The FiT scheme is replaced by a technology-specific sliding scale FiP. FiP aims in promoting the gradual market integration of RES, under two main principles:

- the formation of a new market-based RES "(reference) tariff" mechanism reflecting the decreasing cost of RES, in the form of a revenue support/market-based operating aid, ensuring that RES projects would neither be overcompensated nor undercompensated, and;
- the active participation of RES producers in the wholesale electricity market, compulsory, either directly or through renewable energy aggregators with an ultimate objective to undertake some balancing responsibilities.

The FiP will be added as a premium to the revenues received by renewable generators through their participation in the wholesale electricity market, topping up revenues in order for the relevant operating aid to reach an acceptable level of support measured against a technology-specific reference tariff (RT). Therefore, the sliding premium intends to cover only the difference between the market price and the RT. In case the market value of renewable electricity per technology is in excess of the applicable RT, the excess will be returned to the special account kept by the market operator or the network operator, as the case may be.

The RT, applicable to a RES project categorized per technology, is deemed to reflect the reasonable (average) cost for which the RES producers shall be compensated. Its calculation will be based mainly on: i) the total Levelised Cost of Energy (LCOE) incurring through the use of a certain RES technology, and ii) a reasonable Internal Rate of Return (IRR) incorporated in the LCOE. The determination of the LCOE accounts for some important technical and accounting parameters, such as: (i) the international developments in the supply prices of the necessary equipment, (ii) the investment maturity of the RES technologies, (iii) the financing conditions, (iv) the construction and interconnection costs (CAPEX), (v) the stable and variable operation costs (OPEX), (vi) a capacity factor, (vii) the expected electricity production, and several other important technical and accounting

parameters. Greek State should monitor the financing conditions and should update, at least annually, the IRR and, subsequently, the LCOE and the RTs. The RTs will be initially regulated for all technologies but, apart from 2017, they will be determined via competitive bidding process for most generators on a project-by-project basis.

Calculation and payment of the operating aid

In the case of FiT Contracts, the operating aid will be equal to the applicable RT. In the case of FiP Contracts, the revenue will be the difference between a Special Market Price per RES (SMPRES) Technology, reflecting the market value of such technology, and the applicable RT for each technology or project concerned, given as FiP = RT – SMPRES. The SMPRES, however, will be calculated differently for intermittent and non-intermittent renewable energy projects. The SMPRES for intermittent renewable energy projects will be calculated on the basis of the weighted average value of the electricity production of each renewable energy technology during one calendar month. Other wholesale electricity market charges and revenues may also be taken into account, especially during the transitional period to the EU Target Model. In case the SMPRES is in excess of the applicable RT, the excess will be returned to the Special Account kept by the market operator or the network operator. More detailed information and guidance on the methodology for all calculations and for the payment procedures will be incorporated in a forthcoming Ministerial Decision.

It is anticipated that this variation in SMPRES calculation would favour the more efficient intermittent projects of the same technology while, on the other hand, would provide incentives for non-intermittent RES projects to produce and insert energy during hours of high demand (and hence of high wholesale market prices).

Application field and exemptions

The new scheme applies only to projects entering into commercial or trial operation in the interconnected electricity transmission system and distribution network after 1/1/2016 (also entering into the FiP Contract provided in L. 4414/2016 with the HEMO). Small scale renewable energy projects (other than wind) with an installed capacity of less than 500kW, wind parks with an installed capacity of less than 3MW, and innovative renewable energy plants (demonstration projects) are exempt from the new scheme; a standard FiT Contract is provisioned in L. 4414/2016, instead of the typical Power Purchase Agreement (PPA) that was available until the end of 2015. Projects entering into commercial or trial operation in the Non-Interconnected Islands (NIIs) of Greece after 1/1/2016, will continue to use a FiT model (through FiT Contracts) as long as these islands are either not interconnected with mainland or do not have a fully operational daily electricity market. In the event of interconnection or emergence of an effective daily electricity market, the FiT Contract will be converted to FiP Contract for the remaining period, provided that the project is not exempt from compulsory FiP contracting because of small project size.

Transitional period for projects with signed PPAs - Grandfathering

The potential direct impact that such a reform would have on capital financing is taken into account and therefore grandfathering transitional provisions are included for investments, which have reached a certain stage of licensing maturity and do not undermine investor confidence and reducing investments. The new RES support scheme, as proposed by the Greek State, is intended to apply only to new RES projects with a PPA signed after 1/1/2016.

Operating projects and projects still under development, which have signed a standard PPA with HEMO or HEDNO in the NIIs, before 1/1/2016, will continue receiving operating aid under the previous FiT support scheme, provided that any new-built projects in the case of wind, small hydro, biomass or biogas projects enter into commercial or trial operation by 30/6/2018. Otherwise they will have to switch to the new support scheme and sign the new FiP or FiT Contracts, as applicable depending on installed capacity, but will be excluded from any competitive bidding process as long as they enter into commercial or trial operation by 31/12/2018. All these projects with an installed capacity of more than 5MW will also be given the option to voluntarily switch to the new FiP-based support scheme.

Organisation of the daily electricity market

Current market model is a mandatory power pool with single clearing prices for energy and imbalances, do not permitting bilateral contracts with physical deliveries. RES producers will fully participate in the market and are expected to accept the relevant obligations (including balancing) once the new wholesale electricity model is implemented. The introduction of such obligations has created though significant constraints, for potential market participants, mainly related to the currently applied operation model, which is based on DAS without providing for an intra-day market, since RES producers are not in a position to make long-term production estimations. The Greek State has, therefore, decided to apply a transitional mechanism for accurate electricity production forecasts until the full implementation of the new wholesale electricity model.

Regulated Reference Tariffs and Competitive Bidding Processes for RES and HECHP power plants

The RTs for all renewable energy technologies and categories of projects provided in L. 4414/2016, other than solar PV with an installed capacity in excess of 500 kW, are set administratively for 2016 (and remain applicable for the term of the relevant FiP or FiT Contract signed in 2016); see Table 1, where only onshore and offshore wind parks are presented. Any subsequent revision of these RTs, which may occur annually within the first quarter of any calendar year, will apply to new projects reaching commercial or trial operation after the first day of the subsequent calendar year. Accordingly, there is a lead time for project commissioning of almost three calendar years before a revised RT is applied.

RES Production Technology	**RT (€/MWh)**	**Project IRR[a] (%)**
Onshore wind parks in the Interconnected system	98	9
Onshore wind parks in the Non–	98	9

RES Production Technology	RT (€/MWh)	Project IRR[a] (%)
Interconnected system (Islands)		
Offshore wind parks or onshore in inhabited islets or NIIs that get interconnected through cable paid by the generator	uplift x25%[b]	

[a] *The level of the Project IRR is based on the provisions of the draft law as initially set under public consultation.*
[b] *Granted to the relevant RES producers only via a Ministerial Decision, following RAE's opinion.*

Table 1. Indicative Reference Tariffs for some RES technologies of interest, set according to L. 4414/2016

Subject to project size-specific exemptions that will continue enjoying regulated RTs, from 1/1/2017, all other renewable energy technologies and categories of projects will be eligible to receive operating aid only through a competitive bidding process to set the relevant RT per project. RES power plants, which will finally be selected through the competitive bidding, regulated RTs and competitive bidding processes will form the basis of the RT, resulting from the submission of bids in the context of the bidding process.

The responsibility for the organization and the performance of the relevant competitive bidding processes is assigned to RAE. In this context, it is required that RAE will run some pilot tenders in the last quarter of 2016 for 40MW of solar PV capacity with maximum bidding prices per project category. Two Ministerial Decisions are pending to be issued, following an opinion from the RAE, for determining in more detail the structure and functioning of the bidding processes.

Contract Terms

It seems rational that the RT should remain guaranteed until the power plant has been fully depreciated according to standard accounting rules. Subsequently, the valid period of the new FiP and FiT Contracts (or PPAs) and the associated operating aid for all renewable energy projects has been set to 20 years, except for solar thermal power plants which is up to 25 years. The form, the content and the details of the new contracts will be determined by Ministerial Decisions that need to be adopted by the Minister of Environment & Energy, following a proposal from the HEMO and an opinion of the RAE. It is anticipated that they will be notably based on the standard PPAs that were available until the end of 2015 while price-clearing and settlement procedures will be significantly revised. Project sponsors and potential financiers are therefore not expected to be envisaged through an entirely new contract form for the sale and purchase of renewable electricity.

Restructuring of the RES Special Account

The Greek government has committed by the MoU signed with European partners, among others, to amend the current framework concerning RES Special Charge and the structure of the RES Special account, by respecting on the same time existing contracts in line with the EU rules so that the deficit in the RES account is eliminated over a 12-month horizon (and not later than 6/2017). Specifically, L. 4414/2016 adopted proposals from the RAE on this issue and a new funding source for the RES Special Account is introduced, related to the revenues generated from the imposition of a charge (in

€/MWh) on all load representatives, in order to deduct existing distorting practices in the calculation of the System Marginal Price (SMP) due to the participation of RES in the DAS. The intension is to oblige electricity suppliers benefiting from the lower SMP (due to RES participation in the DAS) to cover the deficit caused in the RES Special Account. A provision is made for two separate, but interconnected, Special Sub-Accounts for Renewable Energy plants, that will be held and managed by the HEMO and the NIIs network operator, HEDNO, for their areas of competence.

Licensing process for new wind energy projects

The main steps that are required in order to lawfully develop, construct and operate an OWF under the Greek authorisation model for new renewable energy capacity are the following:

I. Production license: This license is required only for installed capacity higher than 100 kW. The production license is issued by the RAE. The evaluation criteria are described in L. 3851/2010, art. 2.1, while the license is valid for 25 years and can be extended up to an equal period.
II. Network connection offer: The Operator should provide the applicant all the necessary documents related with the network connection offer within four months after the corresponding request. This offer is definitive after the issuance of environmental terms approval. After the finalization of the network connection offer, it is valid for four years.
III. Installation license: The next issues are followed by the applicant: i) the installation permission, ii) the conclusion of the connection and sale contract, iii) provision of all relevant licenses, protocols or other approvals that may be required in accordance with the provision of existing legislation, issued without prior authorization for installation, and iv) if required, amending environmental terms approval. The installation license is valid for two years (following verification of the relevant prerequisites) and can be extended up to four years, under specific conditions.
IV. Environmental terms approval: Submission of all necessary documents along with Environmental Impact Assessment (EIA) to the competent authority that is responsible for the environmental licensing. This authority examines not only the environmental impacts, but the proposed (preventive and remedial) measures as well. Regarding the installation of power station from RES, the decision on the environmental terms is valid for ten years (following review of the EIA study) and it can be renewed, with an application six months before its expiry, for one or more times.
V. Operation license: The producer applies for the administration of the operation license that is given from the corresponding competent service after a successful testing operation. This service examines the compliance of the technical conditions of the installation during the trial period, and regulates the necessary operational and technical characteristics of the OWF equipment. The operation license is valid for 20 years and can be extended up to an equal period.

Due to the rich underwater environmental heritage, including significant classical antiquities, and the Natura 2000 sites across Greece, the most critical licensing step for the OWF development is the environmental licensing. The above mentioned procedures can be also found in http://www.lagie.gr/systima-eggyimenon-timon/ape-sithya/adeiodotiki-diadikasia-kodikopoiisi-

nomothesias-ape/periechomena/aiolika-stin-xira/aiolika-parka-sti-thalassa/ and http://energypress.gr/news/nomiko-plaisio-adeiodotiseon-aiolikon-parkon (both websites are in Greek).

Revised national policies: 2012–2017 and 2020–2050

The revised national policies in Greece as regards RES refer to two different time horizons: 2012–2017 and 2020–2050.

2012–2017: The Greek Government proceeded with the increase of its national goal (from 18% to 20%) regarding the participation of renewables in the final energy consumption at a national level. This objective is composed of 40% participation of RES in electricity production, 20% in heating and cooling and 10% in transport while 13.3 GW of renewables are expected to be developed. The currently installed capacity and the licensing process suggest that Greece is on track to achieve its national objectives.

2020–2050: Moreover, in 2012, starting with the first Action Plan for Renewable Energy, the National Energy Strategy Committee elaborated a long-term analysis of the Greek energy system in order to propose an Energy Road Map in this time horizon (http://www.ypeka.gr/LinkClick.aspx?fileticket=rTTnMWI1RCc%3D&tabid=786&). The national long-term energy strategy can be summarized in the following key-points:

1. Reduction of greenhouse gas emissions by 60–70% by 2050 compared to 2005;
2. 85–100% of electricity obtained from RES and total RES penetration at a rate of 60–70% in gross final energy consumption by 2050 combined with significant reduction of oil consumption;
3. Stabilization of total energy consumption due to energy-saving measures; relative increase in electricity consumption (e.g. due to electrification of track-based public transport modes and short-distance passenger transport) combined with increase of use of biofuels in transport at the level of 31–34% by 2050;
4. Penetration of RES applications in the building sector;
5. Development of decentralized production units and Smart grids.

A detailed overview can be found in the following websites: https://www.iea.org/publications/freepublications/publication/Greece2011_unsecured.pdf, and http://www.reegle.info/policy-and-regulatory-overviews/GR.

Current status of OWFs in Greece

Currently, there is no provision for marine energy technologies in the Greek legislation, except for OWFs. Specifically, no reference FiTs have been set, which are used as reference values in the FiP system. Therefore, commercial marine energy projects cannot be implemented at the moment with the exception of offshore wind projects.

Just after implementation of L. 3851/2010, some candidate locations for potential OWF development during the period 2012–2017 were identified, based on a preliminary spatial planning according to specific criteria (e.g. the available wind power potential, minimization of visual impact, the compatibility of wind farm development with other marine uses in the same area, environmental effects and impacts, etc.). The foreseen development was based on offshore wind turbines with fixed foundations and therefore the identified locations were in shallow (less than 30 m depth) or intermediate (close to 30 m depth) water depth areas; see also Figure 21. The initial spatial planning is currently being reconsidered by a consortium comprising of CRES, HCMR and the private sector; no final suggestions have been provided yet.

L. 3851/2010 (art. 6) for RES, permits the installation of OWFs within the national waters and provides a new, centralized procedure for authorization. According to the HEMO, the first step that should be made for the permitting process is the preparation of strategic environmental impact studies that should be submitted to strategic environmental assessment in order to determine the location of OWFs, the marine area occupied and the maximum installed capacity. The next steps refer to: i) the final definitive design that should be approved by a Presidential Decree; ii) the issuance of the permitting license for installation of the approved OWF, and; iii) the open call for tenders for the construction of these projects and their connection with the network system. The procedure of open calls for tenders (L. 3851/2010), was annulled later by L. 4030/2011 (Art. 42 Par. 20) but retained the requirement that applications for offshore installations respect the marine spatial planning depicted in Figure 21. An analytic guide for evaluating applications for granting production license for OWF development is published in the Official Governmental Gazette (FEK B'308, 14/2/2012). L. 3851/2010 has been amended by law L. 4203/2013. As mentioned before, L. 4414/2016 established the sliding FiP scheme for offshore wind projects.

Nevertheless, up to now no OWF has been erected yet. So far, there are two Electricity Production Licences from OWFs issued by RAE: 1) offshore Alexandroupolis in Thrace with capacity 216 MW and 2) offshore Limnos Isl. with capacity 498 MW. Moreover, there are 14 applications still pending with capacities ranging from 50 MW (in the offshore area Dikella-Alexandroupolis) up to 584.25 MW (Thracian Sea).

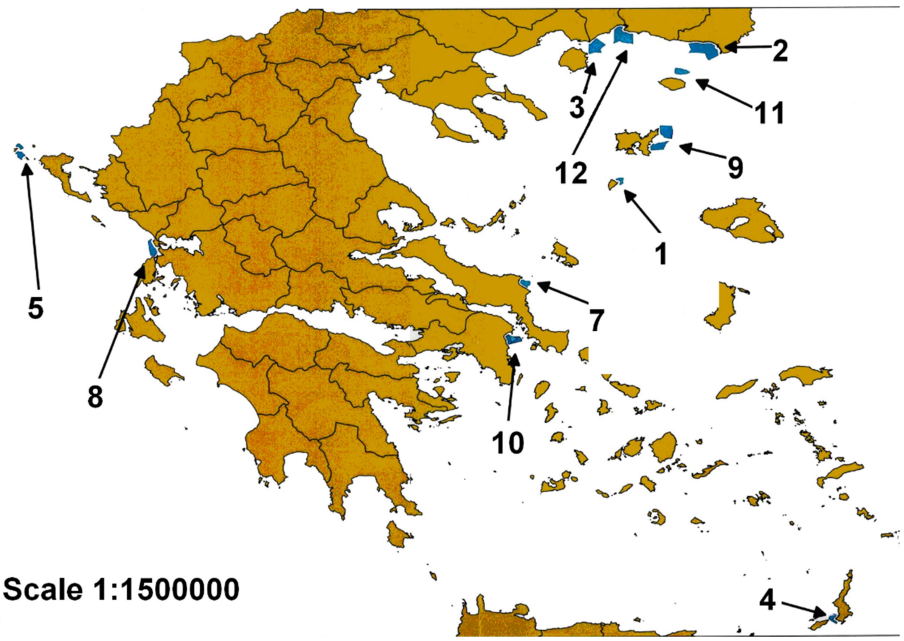

Fig. 6: Preliminary spatial planning of potential locations for offshore wind farm development

Recent updates as regards OWF planning in Greece

The current situation as regards marine spatial planning for OWF development in Greece is the following: A new round of re-assessments as regards the areas shown in Figure 21 has been finished, taking into account wind energy and atmospheric characteristics, landscape – seascape, marine biotic and abiotic environment, bird routes, historical and cultural heritage, visual and noise impacts, marine uses, socio-economic considerations, existing infrastructures, aviation issues and military areas. Various organizations have been contacted in order to provide advice and guidelines including among others: Hellenic National Defence General Staff, HCMR, Ministry of Environment and Energy, Directorate General of Sustainable Fisheries, General Directorate of Antiquities and Cultural Heritage. The minimum distance from shore has been set to 3 km and for some locations to 6 km, while Natura 2000 areas and Important Bird Areas in Europe have been totally excluded. The administrative procedures that should be followed are described in FEK 1225/B/5-09-2006.

The impact assessment takes into consideration the following parameters: 1) Wind energy potential – Wind climate, 2) Landscape – seascape, 3) Marine abiotic environment, 4) Marine biotic environment (marine protected areas, marine habitats, marine mammals and cetaceans, other fauna), 5) Birds – Bird routes, 6) Historical and cultural heritage, 7) Atmospheric conditions / climate change, 8) Visual and noise impacts, 9) Marine uses, socio-economic considerations, existing infrastructures (e.g. maritime traffic, port facilities, fisheries, swimming and recreation areas, tourism, network connections, underwater cables, etc.), 10) Aviation issues, and 11) Military areas.

3 Social, economic and environmental factors and issues

3.1 Socioeconomic impacts

Although this paragraph mainly focuses on the impacts of Blue Energy deployment that are immediately quantifiable as monetary costs or repayments, it is of capital importance that unbiased socioeconomic impact assessments also account for apparently intangible goods, such as the cultural and aesthetic value of landscape, wildlife, environmental quality or biodiversity. These not only define and interweave the multiple, intimate relations between local communities and their natural environment, and therefore have significant non-monetary value, but also provide vital ecosystem services that offer economic advantages in the form of avoided and replacement costs, as well as of factor income, often only appreciated long after their disruption.

Attempting to assign monetary values to nonconsumptive public goods and to their functions presents several challenges. They might even be impossible to accurately calculate, as certain intangible values lose their significance in the process. However, a multidisciplinary effort must by necessity be implemented, in order to account for the parallel economy of the commons when evaluating the trade-offs and alternatives that are to be proposed to the public, in the context of a mature participatory decision-making process capable of accounting for the social and economic consequences of development and conservation. Such an approach is indeed mandatory in view of the social resitance to offshore installations that has been growing in some local communities (e.g. along the Italian Adriatic shores), and of the active role local representative bodies have in the authorization process, which can lead to project rejection or anyway to costly delays.

The following sections largely refer to the findings of the FP7 CoCoNET project, which investigated the main socioeconomic impacts connected to the development of the Blue Energy sector.

Construction, operation and implementation of Blue Energy platforms

The development and implementation of offshore renewable energy technologies contributes to stimulating innovation and investment in innovation, thus reinforcing the competitiveness of local and regional economic activity, indicating new opportunities for growth and adding to the already growing demand for highly qualified professionals in the EU eco-industry. It stimulates the development of high-tech, sustainable infrastructures in cohesive investment areas, promotes business activities, the establishment of efficient business networking and of collaborative R&D (Research and Development), and the enhancement of competition among the involved enterprises in the field of offshore energy. It can promote cooperation with local suppliers and enterprises. Creation of new jobs can therefore be expected at the continental, national and local scale.

A number of ancillary economic activities can benefit from the increased penetration of these technologies, thus cumulating the investment expenditures, such as construction, electrical and mechanical engineering, other manufacturing activities, marine transport and related services, land based transport, professional services for the assembling procedure and accommodation services.

Direct positive impacts on the above large scale economic sectors are expected during the construction, the operation and the decommissioning phase, while the operative life of the plants will lead to indirect benefits on the local district economy, thanks to the expenditures of the employees and to the continuous demand for local services, including accommodation services. Both types of impacts will increase the Gross

Domestic Product (GDP), the derived benefits of the operation phase being expected to mainly contribute to the local and regional development by exploiting the existing potential.

Local taxes can be derived by property and excise taxes paid to the corresponding municipalities by workforce and enterprises during the construction, operation and decommissioning phases of blue energy projects while state taxes include income and sales taxes paid by workforce and enterprises [11]. The imposition of corporate, local and regional taxes will result to a corresponding increase of revenues through the direct, indirect and induced increase of GDP and employment.

The development of the Blue Energy sector would help achieve economies of scale in all the connected and ancillary sectors, and is expected to increase the national and the European export to import ratio, thus leading to better balance of trade and providing competitive advantages for the national economy [12].

Tourism

According to the available studies, impacts on tourism and leisure activities can be negative, positive or negligible, depending on the implementation phase of the offshore installations. In particular, temporary disruption to the tourism sector is expected during the construction and decommissioning phase of an offshore park. As regards offshore wind farms, during the operation phase, the main threat to tourism appears to be undesirable visual intrusion, which is worst in clearer air and sunshine, while other impacts can be minimal provided mitigation measures are implemented. On examining whether potential visual nuisances may be compensated by offshore wind farm associated reef-recreation or by adopting a coherent environmental policy, a study specifically devoted to installations in a Mediterranean environment indicated that age, nationality, vacation activities and loyalty to holyday destination influence the public's attitudes toward compensatory policies [13]. Two alternative policies are recommended: first, all other conditions being equal, wind farms should be located no closer than 12 km offshore; second, a wind farm can be located from 5 km and outwards without a loss in tourism revenues if accompanied by a coherent environmental policy and wind farm associated recreational activities. No data are available for sites of particular historical interest and/or located in particularly beautiful landscapes, which are not always included in officially protected areas, [13-16]. It is to be noted, however, that while disamenity costs decline as the distance from the coast increases, transmission, construction, and maintenance costs typically rise with distance, therefore posing the crucial question of optimal trade-offs in the economics of near shore Blue Energy plants [17].

Maritime traffic and fisheries

The construction and operation of offshore Blue Energy platforms can also affect maritime traffic. Only few assessments of the effects of offshore installations on navigation are available, but at present it appears that no significant risk to marine traffic exists, one potential problem arising in shallow waters, where the traffic is mainly due to crab fishing vessels [14].

Fishing is also liable to be impacted by offshore infrastructures, although only a very small portion of the fishing area would be off-limits for fishermen due to the presence of offshore installations. However, transmission cables can interfere with fishing activities, while the construction, operation and ultimate decommissioning of installations can have adverse effects on fish populations, resulting in a potential depletion of stocks around individual sites. On the other hand, aquaculture activities are likely to profit from business ventures with the Blue Energy industry provided these are managed on a case-by-case basis,

and projects are jointly developed on the basis of adaptive management, rather than separately pursued sectoral targets [18].

Residential property values

Residential property values can be negatively impacted by the presence of Blue Energy installations due to the disamenity costs of visual impacts, which might be compensated by lower property taxes. The latter, however, would result in lower property tax revenue for the country. In addition, impacts on the tourism sector would affect commercial property values (i.e. summerhouse rentals) in coastal areas [19].

3.2 Environmental Impacts

Accounting for the environmental impacts of Blue Energy installations is not deferrable, since it is obvious that any artificial ocean structure causes changes to the marine environment, both adverse and beneficial. For example, the measures and precautions taken during the operation of an offshore plant, such as the interdiction of trawling within the concerned area, are proved to be beneficial for the marine flora and fauna, or the development of hard bottom habitats due to the presence of the platform foundations. However, there has been a long debate as to the potential impacts of offshore installations on the marine wildlife (biotic components), the conclusion being sometimes very controversial and not always based on scientific evidence.

It is anticipated that by 2030, 12-16% of the EU electricity demand will be supplied by offshore wind farms (OWFs) [20]. Compared to other forms of ocean energy (e.g. wave and tidal power), offshore wind energy seems to be comparatively more developed from both the technological and environmental point of view. Since OWFs have been fully operative for a relatively short period, research on the potential associated environmental impacts is also limited. Moreover, current assessments of the effects of existing OWFs in Northern European Seas may not be applicable to the Mediterranean, and site-specific analyses are needed before large-scale offshore wind energy exploitation is initiated [21]. However, since onshore wind farms have been in use for a longer time, it is possible to very carefully extend the available information on their relevant environmental impacts to the case of OWFs, for example, as regards the effects on bird migrations.

The assessment of the environmental impacts should be considered along the entire operational life of a plant, as well as during the construction and decommissioning phases. The available information for the rational impact assessment currently relies on three strategies:

1) gathering existing experience from relevant/similar activities;
2) implementating simulation models, and;
3) conducting ocean and environmental monitoring/surveys during the planning, the construction and the operational phase of the offshore plant, which is the most important (though expensive) action for an effective environmental impact assessment study. Water quality and pollution indicators should be derived and analyzed, together with the associated impacts on benthic, sea mammal, pelagic, and bird communities. Ornithological surveys may be conducted on sea, resting and migrating birds, as well as sea mammal surveys on cetaceans and seals. The surveys could be

extended onshore in order to assess the potential impact of on-shore stations and power transfer cables on the surrounding environment.

Key issues and sources of potential impacts are expected to significantly vary from site to site, and with the progress of our knowledge and understanding, and require for their magnitude and acceptability to be identified and constantly updated.

3.3 Social acceptance

Despite the documented widespread support of renewable energy exploitation (European Commission, 2006), on several occasions local communities oppose the installation of plants, thus delaying its implementation. An explanation for this apparent contradiction between public acceptance at the local and at the national levels is the Not-In-My-Backyard (NIMBY) syndrome, by which individuals favour proposed interventions and/or installations provided they are implemented away from their own community [22]. However, the NIMBY syndrome has been criticized for not being capable of capturing the multifaceted social attitudes and preferences towards complex and strategic matters such as energy production, as it strongly depends on age, education and social rank [23], [24]. A public effort to inform and involve citizens in participatory decision-making processes, illustrating necessary trade-offs and possible alternatives, is therefore mandatory.

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